MIL-I-4997A(USAF)
8 August 1956

Superseding
MIL-I-4997(USAF)
6 April 1955

MILITARY SPECIFICATION

INSULATING AND JACKETING COMPOUNDS FOR USE IN CORDS, CORDAGES, AND CABLES

1. SCOPE

1.1 This specification covers specific requirements for conductor insulating and jacketing compounds for cords, cordages, and cables used with audio-frequency communication equipment.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on the date of invitation for bids, form a part of this specification:

SPECIFICATIONS

Federal

J-C-98 Cable and Wire, Insulated; Methods of Sampling and Testing

(Copies of documents required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Design.- The requirements specified herein represent the minimum acceptable standards. Improvements in the performance and reliability of cords, cordages, and cable beyond the requirements of this specification are objectives to be considered in the compounding of the specified materials. The conductor insulating and jacketing compounds, when fabricated into cord, cordage, or cable shall have long life under severe service conditions, in temperatures between -55°C and +85°C, and shall be highly resistant to deterioration because of intermittent or constant exposure to perspiration, human oils, sunshine, ozone, and abrasion.

3.2 Materials and Physical Properties

3.2.1 Materials.- The materials used shall be formulated to provide compounds meeting the applicable requirements of this specification and to provide finished cable, cord, or wire meeting the requirements

of the applicable finished-product specification. Natural rubber and latex insulating compounds shall contain not more than 0.5 percent-free sulfur, and GR-S (Buna S) insulating compounds shall contain not more than 0.25 percent-free sulfur.

3.2.2 Conductor Insulating Compound.- The conductor insulating compound shall consist of a layer of natural rubber latex and a color-coded outer layer of polychloroprene latex approximately 0.003 inch thick, bonded together. (The color of the inner layer may be any light color at the option of the manufacturer.) The natural rubber layer shall contain not less than 90 percent purified latex rubber. The conductor insulation compound shall meet the material and physical property requirements specified herein. Conductor insulation of a different construction but having equivalent or better electrical, physical, and resistance-to-deterioration qualities will also be considered providing the manufacturer submits evidence to the procuring activity that the proposed construction is at least the equal of the construction specified herein.

3.2.3 Physical Requirements for Conductor Insulation.- The insulation shall show no evidence of cracking or other damage as a result of the aging and bending. The polychloroprene layer or an approved equivalent treatment shall render the conductor insulation weather resistant.

3.2.4 Jacketing Compound.- The jacketing compound shall be low-temperature polychloroprene rubber and shall meet the material and physical property requirements of table I, as shown.

TABLE I

Physical Property Requirements For Jacketing Compounds of Finished Cord Specimens

Wall thickness, inch	0.014 to 0.019	0.020 to 0.030	over 0.030
Property			
Unaged:			
Tensile Strength, minimum, psi	1200	1500	1800
Elongation, minimum, percent	250	250	300
Set, maximum, inch	----	----	3/8
After 96 hours aging in oxygen bomb at 70°C:			
Tensile strength, minimum, psi	1000	1200	1600
Elongation, minimum, percent	200	200	250
After oil immersion:			
Tensile strength, minimum percent of original	50	50	60
Elongation, minimum percent of original	50	50	60

TABLE I (Continued)

Ozone resistance: After 2 days when wrapped 4 times around the outside mandrel at room temperature, and 7 days in atmosphere, containing 25 parts plus or minus 5 parts ozone per one hundred million parts of air at a temperature of 50°C	no cracks	no cracks	no cracks

3.2.5 Operating Temperature Range and Cold Bend.- The conductor insulation and jacket of cord, cordage, or cable made of the insulating and jacketing compounds specified herein shall, without appreciable deterioration, withstand continuous service use while exposed to +71°C and, with intermittent exposure, to +95°C, and shall be flexible and resilient throughout the temperature range of minus 55°C to plus 85°C and shall show no evidence of cracking or other damage as a result of the cold bend test specified herein.

3.3 Electrical Requirements

3.3.1 Dielectric Strength.- For each length of finished cord, cordage, or cable, the insulation between conductors shall withstand, without flashover or breakdown, the application of a 500-volt alternating potential of commercial line frequency for 5 seconds.

3.3.2 Insulation Resistance.- The insulation resistance of the cord, cordage, or cable shall be not less than 100 megohms per 1,000 feet when measured at or corrected to 15.5°C.

4. QUALITY ASSURANCE PROVISIONS

4.1 Standard Test Conditions.- Unless otherwise specified in the specification covering the completed cord, cordage, or cable, all tests shall be conducted under the environmental conditions specified in J-C-98.

4.2 Sampling Procedure.- Except for ozone resistance and cold bend tests, samples shall be selected at random or at regular intervals throughout the lot, shall be representative of the cord, cordage, or cable supplied on contract or order, and shall be in accordance with the sampling schedule listed below:

No. of feet per lot	No of samples
Up to 10,000	2
Each additional 10,000	1

4.2.1 Sampling for Ozone and Cold Bend Tests.- One sample shall be selected from each 100,000 feet of cord, cordage, or cable, or one month's production, whichever is smaller.

4.3 Test Procedures

4.3.1 Physical Tests

4.3.1.1 Jacketing Compound

4.3.1.1.1 Tensile Strength.- Tensile strength shall be determined in accordance with Method 3021 of J-C-98, except that a one-eighth die may be used to prepare the test specimens.

4.3.1.1.2 Elongation.- Elongation shall be determined in accordance with method 3031 of J-C-98 except that bench marks shall be 2 inches apart. The elongation after aging shall be based on the bench marks applied before aging.

4.3.1.1.3 Set.- Set shall be determined in accordance with Method 3161 of J-C-98, except that

a. Bench marks shall be 2 inches apart.

b. The test specimens shall be stretched so that the distance between bench marks is 6 inches; they shall then be released within 5 seconds.

c. Set shall be determined 1 minute after the beginning of release.

4.3.1.1.4 Oxygen-Bomb Aging.- Oxygen-bomb aging shall be performed in accordance with method 4011 of J-C-98 except that the aging period and temperature shall be as specified in table I.

4.3.1.1.5 Oil Immersion.- Oil immersion shall be performed on sheath specimens in accordance with method 4223 of J-C-98.

4.3.1.1.6 Ozone Resistance.- The specimens for checking the complete assembly of the cord, cordage, or cable shall be wrapped around a mandrel that is four times the outside diameter of the specimen in such a manner that they are kept taut throughout the test. The mandrels and specimens shall be kept at room temperature for 2 days, after which they shall be placed in an atmosphere containing 25 parts plus or minus 5 parts of ozone per one hundred million parts of air. The temperature of 50°C shall be maintained for a period of 7 days. After the test has been completed, the jacket of the specimen shall be examined through a magnifying glass of at least 3 diameters.

4.3.1.1.7 Cold Bend.- The specimens for checking the complete assembly of the cord, cordage, or cable shall be attached to the proper size mandrel as specified in table II and suspended vertically with lower ends weighted sufficiently to keep specimens taut and to permit bending them without handling. The mandrels and specimens shall be placed for at least

20 hours in the cold chamber at minus 55°C, and while at this temperature, shall be bent for 5 close turns around the mandrel at the rate of approximately 15 turns per minute. After the test has been completed, the jacket shall be examined through a magnifying glass of at least 3 diameters magnification. After examination of the jacket, it shall be removed from the specimen of cord, cordage, or cable, and the conductor insulation examined for cracks using a magnifying glass.

TABLE II

Mandrel Sizes for Cord, Cordage, and Cable

Outside Diameter, Inches		Maximum Mandrel Size		
		Cord, Cordage, and Cable		Individual Insulated Conductor
From	To	Unshielded	Shielded	
0.000	0.150	1.0 by OD	3.0 by OD	10 by OD
0.151	0.250	1.0 by OD	3.0 by OD	---
0.251	0.300	1.0 by OD	3.0 by OD	---
0.301	0.350	2.0 by OD	3.0 by OD	---
0.351	0.450	2.5 by OD	3.0 by OD	---

4.3.1.2 Conductor Insulation Compound

4.3.1.2.1 Aging and Bending Test.- A sample of insulated conductor shall be aged for 96 hours in an oxygen bomb at 70°C and 300 pounds per square inch. After aging, the specimen shall be wrapped five times around a mandrel of approximately 2-1/2 times the diameter of the specimen.

4.3.1.2.2 Cold Bend.- The specimen selected for checking insulation compound shall have the jacket removed and each insulated conductor shall be tested as indicated in 4.3.1.1.7 using a mandrel size as indicated in table II.

4.3.2 Electrical Tests

4.3.2.1 Dielectric Strength.- Each length of finished cord, cordage, or cable shall be subjected to an alternating potential as outlined in 3.3.1. The voltage source shall have a capacity of not less than 3 kva.

4.3.2.1.1 Unshielded Items.- For unshielded cord, cordage, or cable, an alternating potential as specified in 3.3.1 shall be applied between two terminals, one being each conductor, in turn, and the other being all remaining conductors tied together.

4.3.2.1.2 Shielded Items.- For shielded cord, cordage, or cable, an alternating potential as specified in 3.3.1 shall be applied between two terminals, one being each conductor, in turn, and the other being all the remaining conductors and shield tied together.

4.3.2.2 Insulation Resistance.- Immediately after the cord, cordage, or cable has successfully withstood the dielectric strength test, the insulation resistance shall be measured. Measurements shall be made using procedures indicated in the applicable dielectric strength test as specified herein. If the measurement is made at any other temperature, the contractor shall correct the measured value of insulation resistance to 15.5°C. The contractor shall demonstrate that the correction factor is accurate for his compound. In making the insulation resistance test, the test may be terminated in less than one minute if the galvanometer has ceased fluctuating and the reading indicates that a steady insulation resistance value has been obtained.

5. NOTES

5.1 Intended Use.- The material required by this specification is used in the fabrication of cords, cordage, or cable for interconnection of components of audio frequency communication equipment.

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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